CHEWING GUM CONTAINING STYRENE-DIENE BLOCK COPOLYMERS

REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application Ser. No. 60/754,987, filed Dec. 29, 2005, the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates generally to a chewing gum composition, as well as methods for the preparation thereof. More specifically, the present invention relates to a gum base, as well as a chewing gum composition prepared therefrom, which contain a styrene-diene block copolymer, such as a styrene-butadiene block copolymer.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a gum base comprising an elastomer and an elastomer plasticizer, wherein the elastomer comprises a styrene-diene block copolymer, as well as a chewing gum comprising this gum base. The present invention is particularly directed to such a gum base wherein the styrene-diene block copolymer is a block copolymer of styrene and butadiene. The present invention is also particularly directed to such a gum base which comprises a polymer blend of a styrene-diene block copolymer and another elastomer such as styrene-diene random copolymer.

The present invention is further directed to a method for preparing a gum base as detailed herein above. In one particular embodiment, the present invention is directed to a method of making chewing gum base which comprises: providing a mixer; providing an elastomer to the mixer, wherein the elastomer comprises a styrene-diene block copolymer; providing a plasticizer to the mixer; and mixing the ingredients in the mixer to produce a gum base. Such a process may be carried out in a batch manner or a continuous process wherein all addition and compounding steps are performed using a single continuous mixing apparatus.

The present invention is further directed to a chewing gum comprising a water soluble gum portion and a water insoluble gum base portion, wherein the gum base portion is as detailed herein above. The present invention is still further directed to a method for preparing such chewing gums. More particularly, a method for producing a chewing gum of the present invention may comprise the steps of: a) providing a gum base to a mixer, wherein the gum base comprises an elastomeric component and wherein the elastomeric component comprises a styrene-diene block copolymer; b) providing a plasticizer to the mixer; c) providing a sweetener to the mixer; d) providing a flavoring agent to the mixer; e) mixing the ingredients to form a chewing gum product.

Additional features and advantages of the present invention are described in, and will be apparent from, the Detailed Description of the Invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides improved chewing gum compositions, gum bases for making chewing gum compositions, and methods for the preparation thereof. Pursuant to the present invention, gum bases are provided which comprise a styrene-diene block copolymer elastomer, particularly a styrene butadiene block copolymer elastomer, combined or not with another elastomer, such as, a styrene-diene random copolymer.

Without being held to a particular theory, it is believed that the use of a styrene-diene block copolymer as the elastomeric component of a gum base may be advantageously used to reduce mixing times, elastomer content, and/or energy costs in gum base production, using for example batch mixers, as their viscosity decreases substantially above 100° C. In comparison to styrene-diene random copolymers, such as styrene-butadiene random copolymers, styrene-diene block copolymers may also be processed easier in a mixer-extruder, which are used for example in a continuous process for the production of a gum base and/or chewing gum. It is also believed that such polymers may yield gum bases with special melting properties that may be used in deposited or molded chewing gum products.

I. Gum Base

Thermoplastic elastomers (TPEs), such as styrene-diene block copolymers, are a rubbery material with properties and functional performance very similar to those of a vulcanized conventional rubber, yet they can be fabricated in the molten state as a thermoplastic. Above its softening point, a TPE is fluid and can be molded or extruded with the same equipment and methods as commonly employed for thermoplastics. Below its softening point, a TPE functions as a flexible, elastic rubber. Commercially available TPE block copolymers have two polymeric phases and two glass transitions temperatures: a soft rubbery one and a hard thermoplastic one. Additionally, TPE block copolymers generally fall into one of three categories: (i) block copolymers with alternating soft and hard segments, (ii) blends of a rubbery polymer and thermoplastic, and (iii) rubbery polymer-thermoplastic compositions in which the former is highly vulcanized and finely dispersed in the latter. Currently used random SBR copolymers have only one phase and one glass transition temperature. In addition, TPE Block copolymers are much tougher than the unvulcanized random SBR, which is used in gum base.

Commercially, styrene-diene block copolymers are the largest-volume category of thermoplastic elastomers. Being thermoplastic elastomers, styrene-diene block copolymers advantageously possess the mechanical properties of rubbers, and the processing characteristics of thermoplastics. These properties and characteristics are related to the molecular structure of the copolymer. For example, some of the simplest types of styrene-diene block copolymers consist of at least three blocks; namely, two hard polystyrene end blocks and one soft, elastomeric midblock.

Accordingly, the present invention is directed to the use of styrene-diene block copolymers in the preparation of a gum base. More particularly, the present invention is directed to a gum base which comprises a styrene-diene block copolymer having two or more hard segments or blocks of polystyrene and at least one soft, or comparatively more flexible, segment or block of, for example, a polydiene, such as a polybutadiene or polyisoprene, there between.

It is to be noted that, as used herein, "block copolymer" generally refers to a polymer comprising at least two segments or blocks of differing composition, having any one of a number of different architectures, where the monomers are not incorporated into the polymer architecture in a solely statistical or uncontrolled manner. In some embodiments, the block copolymer may have an A-B architecture (with "A" and "B" representing the monomers). Other architectures